TESTUDINARIA AS A SECTION OF THE GENUS DIOSCOREA

By I. H. Burkill.

Testudinaria does not deserve generic rank but is a section of the large genus *Dioscorea.* Too many species have been described and I reduce them to three whereof the second in the following enumeration may seem to some a subspecies of the first rather than a species specifically distinct. The three are: (i) *Dioscorea* (*Testudinaria*) *elephantipes* to which Burchell's *T. montana* must be reduced; (ii) *D. hemicrypta* which is described below, and (iii) *D. sylvatica* within which all the following fall, *D. rehmanni, D. brevipes*, Knuth's *D. montana*, *T. paniculata* and Marloth's *T. multiflora.* The first and second have a rather restricted distribution within the Cape Province; the third is spread from the area of the others to Northern Rhodesia. Their several distributions are indicated in fig. 1 where the numbers 1, 2 and 3 are placed on the administrative divisions where they occur. *D. hemicrypta* is Marloth's *Testudinaria glauca* which takes a new specific name on transfer to Dioscorea because 'glauca' is a preoccupied adjective under Dioscorea.

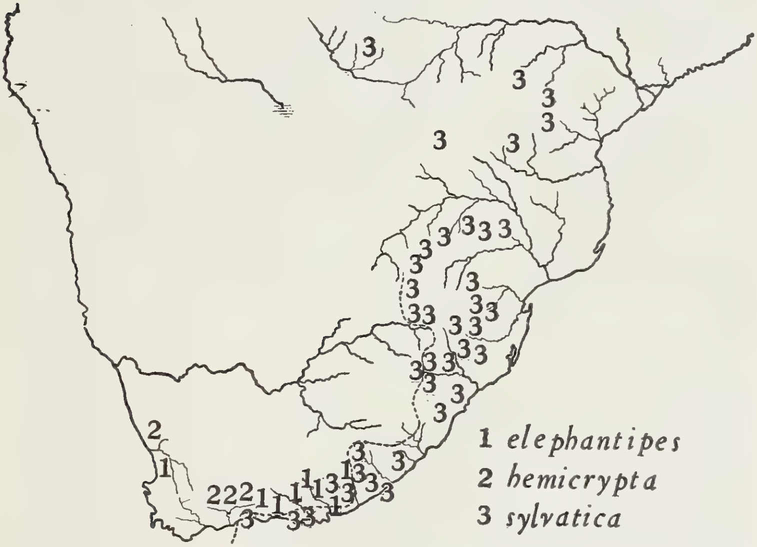

Fig. 1. The distribution of the three species of the section *Testudinaria*: 1. *Dioscorea elephantipes*; 2. *D. hemicrypta* and 3. *D. sylvatica.*

The first of the three had been in Botanic Gardens for 50 years under the generic name *Tamus* or *Tamnus* before the discovery of its fruits showed the error of that name, and *Testudinaria* was suggested in substitution. The Dutch had been at the Cape for 150 years before it came to the notice of botanists, for its home was well beyond their early colonizing.

In 1771 Carl Pehr Thunberg, Linnaeus' most famous pupil, travelling on a grant from the university of Uppsala, arrived in Amsterdam and called on the two Burmans, Jan and his son Nikolaus Lorenz. The father, much impressed by Thunberg's knowledge, suggested a visit to the Dutch settlements in the East and forwarded it by procuring for him an appointment as surgeon by which he reached Table Bay on 16 April, 1772. It was in the next year that he met with *D. elephantipes.*

The chief function of Cape Town from its beginning had been the revictualling of ships; and instructions given to van Riebeeck in 1652 to grow vegetables for the purpose were still so adhered to that there was a state garden (much frequented as a promenade) under a horticulturist, Johan Andreas Auge who, besides his vegetables, embellished the promenade with some ornamental plants. The governor, Tulbagh, who died just before Thunberg's arrival, had encouraged Auge to travel and to collect plants; and Auge had been able to add a little to his pay by selling small herbaria to passengers bound for Europe. He was prepared to travel again and became Thunberg's guide, taking him in 1772 to Saldanha Bay and by the Berg and Breede valleys to Swellendam. While they were away Francis Masson who had been sent out to collect living plants for the Royal Gardens, Kew, arrived at Cape Town and getting the services of a soldier, Franz Pehr Oldenburg, to guide him, made much the same journey as Thunberg was making. Neither of them in that season approached the home of the Dioscorea; but in the next summer they went together under Auge's guidance by Swellendam and eastwards to a point two days' journey beyond the Sundays River. It was somewhere in mountains near their limit that they met with the plant in new leaf, the date of their turning back being 17 December, 1773. Rain had not come to usher in a period of flowering and they were disappointed. It seems curious that there is no mention of the plant in Thunberg's 'Travels' (english edition of 1794-5) nor in Masson's paper in the Philosophical Transactions of the Royal Society (66, pp. 268-317; 1776). There are two specimens in Thunberg's herbarium; one is labelled 'Dioscorea, fuerois Tamnus capensis Th(unbergii). Caulis e bulbo tesselato' and the other 'Tamnus cap(ensis) Th(unbergii). Bulbus tesselatus magnus vivax'; and from the different wording it would seem that Thunberg had fallen in with it twice between which he had made up his mind on the name that he was to give it. Masson would seek small specimens for his purpose and Lindley indicates that he sent more than one to Kew (Lindley in Bot. Reg. 921). Aiton's year for their receipt is 1774 (Hort. Kew. 3, p. 400). Linnaeus' correspondence holds a letter from Thunberg dated 4 April, 1774, in which Thunberg states that he was sending a collection of living plants to Aiton with a request that he would turn them over to the Swedish Legation for redirecting to Linnaeus. It would be natural for Thunberg and Masson to use the same opportunity for their despatch. Thunberg and Masson made another journey together, but nothing connects our plant with it; then they parted, Thunberg for the East and Masson for Britain, and we hear of him as writing to Linnaeus from the address of the horticultural firm of James Lee of Hammersmith. Auge, left at the Cape, probably took the plant into his garden and possibly it was from his garden that David Nelson in 1776 obtained a leafy specimen now at Kew. Outside the Cape it would seem that there were no plants elsewhere than Kew.

In 1788 Charles Louis L'Héritier de Brutelle came to London for materials for his 'Sertum anglicum' and with Aiton agreed to call the plant *Tamus elephantipes*, accepting it and advertising it to appear as plate 40 of his second part. But part 2 never appeared. Aiton used the name on p. 104 of the third volume of his 'Hortus Kewensis' (1789). Ten or more years later James Niven sent further tubers to Europe. Niven had gone to the Cape in 1798 to collect living plants, etc., for the garden of George Hibbert at Clapham and that of the Empress Josephine in Paris; and he remained there until 1812 collecting, then, for the firm of James Lee. Hibbert's plants passed about 1809 into the possession of the horticulturist Joseph Knight who flowered a female plant from a tuber one foot across in or just before 1811; and Sims obtained from it plate 1347 of the 'Botanic Magazine' with a description by Gawler. The female flowers did not determine the genus which remained Tamus. It is not recorded that Niven sent the plant to his other patrons; but the Cambridge Botanic Garden acquired a plant before the issue of the Curator's catalogue of 1807. The Cambridge plant when it flowered proved to be male.

William John Burchell, schoolmaster and Government Botanist in St. Helena, decided to explore at the Cape and moved in 1810 to Cape Town and in 1812 from Cape Town to the eastern scarcely-settled borderland near Port Elizabeth. In 1814 in the Graaf Reinet Division he found *D. elephantipes* with ripe capsules; but not until he was preparing the manuscript of his 'Travels' for the Press does he seem to have been troubled by the need of a name for it; then, in 1820, he consulted Richard Antony Salisbury. Salisbury had already made up his mind that the genus

Dioscorea as it existed should be broken up into several small genera, and he put our plant into none of them, but replied to Burchell by supplying a paragraph from a lengthy paper that he was preparing wherein he proposed *Testudinaria* as a genus apart; and this paragraph Burchell published in his 'Travels' (2, p. 147). The identical words may be found in Salisbury's 'Genera of plants' issued by J. E. Gray in 1866 (p. 14), those of the definition being 'styles united; stigmata short and obtuse; seed winged only at the top, and . . . longer floral envelope' than in *Dioscorea polygonoides* to which West Indian species Salisbury had almost whittled down the genus *Dioscorea*. He did not stress habit, nor the size and armour of the tuber. Salisbury did not live to finish his paper. Neither he nor Burchell put into print the combination *Testudinaria elephantipes* which later authors have variously assigned: it should be attributed to Lindley who accepted the genus at once (1825). But Sprengel (1827) did not accept it; he called the plant *Dioscorea elephantopus*. Nor did Ecklon accept it (1830), nor Endlicher (1836). However Kunth did so in 1850, and Bentham in 1883 but with reservations which he recorded in his and Hooker's 'Genera Plantarum' (3, p. 744). The weight of the tuber was in the scale.

Before the publication of Burchell's 'Travels', some enterprising person at the Cape began to send tubers to Holland for cultivation by such as would have them. Both the Burmans were dead, but a son of N. L. Burman, of the same baptismal names, wrote to Thunberg offering to send to Uppsala a very fine specimen (see M. C. Karsten in Journ. S. Afr. Bot., 5 pp. 11-16; 1939) saying that from being very rare it had become rather frequent among amateurs in the two years before 1822. The occurrence is interesting as suggesting that Linnaeus did not receive the plant when Aiton did.

Burchell thought that a glaucous form of *D. elephantipes* deserved specific rank and called it *Testudinaria montana*. He brought it into his garden at Fulham and when it flowered (male) dried a specimen for his herbarium which is preserved at Kew. Lindley procured for the 'Botanical Register' (11, pl. 921: 1825) a figure from Burchell's garden. In the text it is described as *Testudinaria elephantipes*; and a reference is made to *T. montana* as if distinct; but I believe that Lindley's figure came from Burchell's garden plant of *T. montana*, but as *T. montana* is *T. elephantipes*, the figure is not under a wrong name. Botanists who have opportunities of examining the plant in a wild state should seek to make sure if there is adequate reason for retaining as a variety the name 'montana'. Burchell was the first botanist to collect *D. sylvatica*, but passed it for *D. elephantipes*. James Bowie who collected plants and seeds at the Cape from 1817 to 1822 left almost contemporary specimens, one ticketed as from George, the other as from under the Uitenhage mountains. It grows nearer the sea than *D. elephantipes* as Bowie's labels suggest.

Just before Burchell's 'Travels' was published, Christian Frederick Ecklon, a pharmaceutical chemist, arrived in Port Elizabeth and commenced to collect plants. It was he who, recognizing *D. sylvatica*, gave it this name. He described it in a rare journal that escaped notice; but the name was on the labels of specimens that he sent out, and they led to Kunth's issue of *Testudinaria sylvatica* in 1850. As the reader will appreciate, all knowledge of this species originated in the extreme southern parts of its distribution; and, as by no means uncommonly happens, it got new names when it became known from remote places. Of them for instance, the first synonym, *D. rehmanni*, was given to a plant from the Transvaal when there was as yet no bridging record of *D. sylvatica* in Natal.

It is a character of the section *Testudinaria* that its species have great drought resistance. It seems to me that another of their characters is deficient resistance to damping off. By my experience with seedlings I believe that the species cannot get a footing away from adequately dry places because the seedlings cannot establish themselves; but direct observations would have a value. The section extends into drier country than other Dioscoreas of southern Africa; the dotted line in figure 1 shows by how much. They are found in particular on and near the crests of ridges which force upwards the winds off the sea; and these winds in rising are compelled to surrender the moisture that they carry. The rain is uncertain and its uncertainty gives the seedlings the way of escaping destruction by damping off. When established their longevity aids them. The armour of a large individual is preserved in the Botanical Museum at Cambridge with the date 1849. I suggest that it is the armour of the plant that Donn obtained for the Garden about 1805. In the year 1849 the site of the Cambridge garden was moved; perhaps the plant could not be retained on that account. There is the armour of another individual in the Museums at Kew with the date 1847. If Donn's plant lived from 1807 to 1849, the Kew plant could have been from the first consignment. Old tubers in their native home become covered by a thicket of their own shoots in consequence of getting a multiplicity of heads (see the figure on p. 253 of the Botany of the Valdivia Expedition); Marloth who wrote the account, says so thickly as to hide the tuber; but the life of the shoots is annual. Trimming in cultivation makes the cultivated plant look different and keeps the heads few. If the life of a plant of *D. elephantipes* may be 50 or more years, that of *D. sylvatica* while perhaps less at any rate exceeds 30 (see Dummer in Kew Bull., 1912, p. 195). Sir William Hooker in a 'Guide to the Glasgow Botanic Garden' (p. 33; 1849) mentions a plant of *D. elephantipes* at the Cape with a tuber weighing 700 lbs. and a height of 7 feet. It would seem from records that the usual size both in height and diameter is 3 feet; but more ample records of performance would be welcome and probably not difficult to obtain. Burchell's description of the tuber was 'entirely above ground and growing to an enormous size, frequently three feet in height and diameter . . . the inside is a firm fleshy substance which may be compared to a turnip, both in consistence and colour'. Then he adds that the Hottentots ate it cut in pieces and baked. He called it Hottentots' bread; but that name really belongs to the Cycad, *Encephalartos caffer* which the colonists at the Cape had long known. Thunberg, Sparrman, Ecklon and other early writers apply the name to the Cycad Ecklon and later Bunbury (Journ. Res. Cape, p. 113; 1848) mention the use of the Dioscorea. Von Mohl described the cell-structure of the tuber at the age of three years (Vermischte Schriften, p. 186; 1845) and Miss Sparshott the cell-structure of younger tubers (Journ. Linn. Soc. Lond. Bot. 49, p. 593; 1935). It is probable that saponin is present, but not demonstrated. *D. sylvatica* holds it.

All Dioscoreas are tropophytes, storing food in one season for use in the next and storing with the food a certain amount of water on which growth in the next year may be commenced before rain comes. But leafing is unusual until rain comes. Putting together Thunberg's gathering of new leaf and his statement that rain had not come, premature leafing in *Dioscorea elephantipes* is suggested; as it is commonly held that it does not leaf until rain has come. Its flowering is often much delayed. In the more uniform conditions of a conservatory in Britain it flowers in July or August, after the long days of summer, i.e. later than the northern temperate Dioscoreas which are in gardens in England.

The Dioscoreaceae have evolved under unremitting pressure from herbivores; to conserve their store of food from season to season most of them bury it under a sufficiency of earth; those that do not have alternative protection, it may be by an intense poisonousness and in a limited number of species, including Testudinarias, it is by armour. Armour has not been adopted in Asia as it has been in Africa and America; it is met with in a few African species of the section Enantiophyllum as well as in Testudinaria; and it is met with in America in the sections. Pachystigma, Lychnostemon, Polyneuron and possibly others. The possession of armour is, therefore, not a character by which *Testudinaria* can be set up as a genus apart from *Dioscorea*. Twining comes on when the stems of Dioscoreaceae have attained a sufficient length; dwarfing can preclude it and the small amount of twining that the branches do in

D. elephantipes and *D. hemicrypta* is a response to an early arrest of their growth which is associated with low and abundant branching. This habit is no ground for generic diagnosis. The twining in *Testudinaria* is to the left, which is the direction in more than half of the Dioscoreaceae and fully half of the species of *Dioscorea*. The anatomy of the stem can be matched in a large number of species of *Dioscorea*. A glandular forerunner tip is produced in leaf-development as in *Dioscorea*. It was said to lack glands; but that is incorrect (see for instance Hubert Winckler in Ber. deutsch bot. Gesellsch. 43 p. 590; 1925, and Orr in Notes Bot. Gard. Edinb. 15, p. 136; 1926). The flowers are in cymes along a racemose axis which is a common character in *Dioscorea*. It happens that the cymes in *Testudinaria* are never more than 2-flowered and usually the second is arrested; but that behaviour is readily found in American species of *Dioscorea*. The pedicel is rigid and the flower opens wide with the uncovered stamens or stigmas exposed to rain; and the pollination methods are without complications. This too is readily found in American Dioscoreas that were unknown to Salisbury when he used the character of extruded stigmas for generic diagnosis.

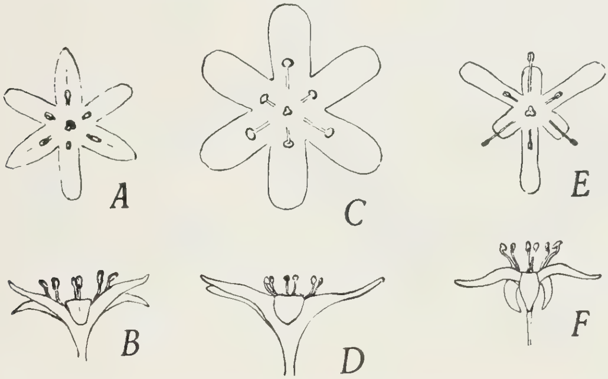

FIG. 2. Flowers from life of the three species of Testudinaria × 5: A and B, of *D. sylvatica*; C and D, of *D. hemicrypta* and E and F, of *D. elephantipes*. That of *D. sylvatica* was produced by a tuber sent by Dr. E. P. Phillips from Pretoria; that of *D. hemicrypta* from a plant raised from seed collected by Prof. E. L. Watkin at the Cango Caves in the Oudtshoorn Division.

Salisbury based his chief claim on the direction of the wing on the seed. It certainly distinguishes the Testudinarias from the majority of the genus *Dioscorea* (including all the rest in Africa), but not from the whole of the genus. Dioscoreas in preparation for the addition of the wing enlarge the loculus and into the space provided the wing is extended just before seed-ripening. Enlargement is connected with lengthening of the placenta; if the placentas lengthen chiefly below the ovules, the wing has room basally; if evenly, in both directions; if above the ovules, apically. Apical wings are found on the seeds of the genus *Stenomeris*, on those of *Dioscorea* section *Paramecocarpa* which is the section most suggestive of Stenomeris, on the seeds of *Dioscorea* section *Stenophora* more or less, and on the seeds of *Dioscorea* section *Shannicorea.* The section *Stenophora* has a wide broken dispersal in the northern subtropics and warm temperate regions (see fig. 3) with its greatest development in China and Indo-China. *Shannicorea*, *Paramecocarpa* and *Stenomeris* occur within and to the south of the Chinese area of *Stenophora*; and it is apparent that a stronghold of 'seeds winged apically' is in south-eastern Asia, towards which the presence of the same feature in *Testudinaria* directs attention. Uline, intrigued by the similarity of the seed of *Testudinaria* to that of some Stenophoras set up a 'subgenus Testudinaria' to hold the two; but it is completely untenable for the reason that the two components are remote from each other in underground parts. Dr. R. Knuth quite rightly dissociated them.

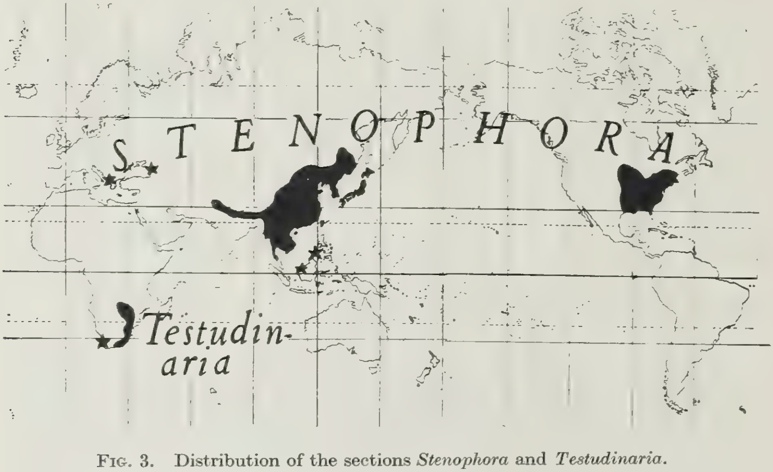

Fig. 3. Distribution of the sections *Stenophora* and *Testudinaria.*

There are two ways in which the seeds of the Dioscoreaceae are set free; either they glide out of the opening capsule or they are jerked out of a capsule which has dehisced apically and holds them free in a kind of cup. Seeds winged basally then have the nucleus at the mouth of the cup and liberation is like throwing the hammer; but seeds winged apically are at a disadvantage and not freed neatly. Surely there have been two lines of adaptation to needs and *Testudinaria* has come of the least effective as well as these sections mentioned. In this line *Testudinaria* perhaps suggests an eastern origin; but by the armour one looks for westward alliances for it. In any case the section must be admitted as distinct. If it be right, and it seems to be right, that *Stenomeris*, as being hermaphrodite and many-seeded, exposes the ancestry of the Dioscoreaceae, then the rhizome of *Stenophora*, found also in *Stenomeris*, is an ancestral condition lost to *Testudinaria*, and the apically-winged seeds common to the two and *Testudinaria* an ancestral condition retained. Both characters being absent from the several sections of *Dioscorea* of Africa other than *Testudinaria*, this section seems to represent a layer spread over the old world earlier than the others. Armour came first to the Testudinarias and long afterwards began to appear in the species of *Enantiophyllum*. It is unfortunate that we know at present too little of the armoured American species to bring them into the picture.

DIOSCOREA section TESTUDINARIA.

TESTUDINARIA, Salisbury as a genus, ex Burchell, Travels inter. S. Afr. 2 (1824) 147; Uline as a subgenus in Engl. Bot. Jahrb. 25 (1898) 157 erroneously including the north temperate section Stenophora; R. Knuth in Engl. Pflanzenreich, Dioscoreaceae, (1924) 50 excluding the section Stenophora. *Tuber* at or above the surface of the soil, perennial, with a thick corky armour and a cambium-like growth-zone. *Stems* annual, stout from the very base, twining to the left. *Hairs*, apart from colleters, absent. *Leaves* entire, if large auricled; forerunner tip small but glandular. *Flowers* rigidly pedicellate in both sexes, on a raceme of cymes which are as abundantly 1-flowered as 2-flowered, opening flat with the anthers or the stigmas extruded. *Seeds* winged unevenly all round, little towards the base of the loculus, considerably towards the apex.

KEY TO THE SPECIES.

1. *Tuber* appressed against the soil and held by roots to it, sometimes nearly globose, but usually rather pyramidal above. *Stems* branching low and rarely ascending to more than a man's height. *Leaves* glaucous or scarcely so, broader than the midrib is long. *Flowers* to 4 mm. in diameter .. .. *elephantipes*

2. *Tuber* pyramidal above ground and lobed in the soil (see fig. 4A). *Stems* as those of *D. elephantipes*. *Leaves* glaucous, longer than broad and apparently not producing large auricles. *Flowers* to 6 mm. in diameter .. .. *hemicrypta*

3. *Tuber* plate-like, up to 60 cm. across, but more usually about 30 cm. across. *Stem* climbing to 6 m. and branching distally. *Leaves* in general much more auricled than the above two species, broader than the midrib is long. *Flowers* 5—7 mm. across .. *sylvatica*

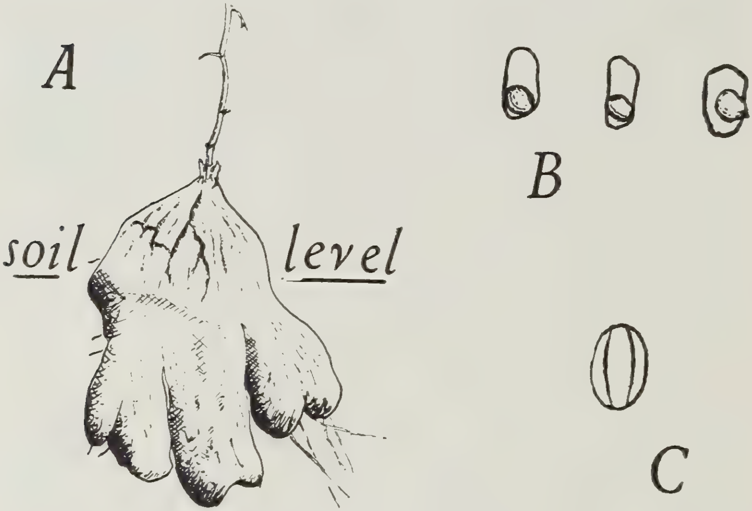

Fig. 4. A, the tuber of *D. hemicrypta* from a photograph by Marloth (origin Oudtshoorn, Taylor, 12738), showing the lobes that are below soil-level. B, seeds, indicating the wing directed upwards. C, a pollen grain, as dry; when wetted it becomes globose.

1. **D. elephantipes** (L'Héritier) Engler in Engl. & Drude, Vegetat. d. Erde, 9 part 2, (1908) 267, and Engl. Pflanzenwelt Afr. 2 (1908) 362 and 1 part 1 (1910) 469; Stoneman, Pl. and their ways in S. Afr. (1915) 377. *D. elephantopus* Sprengel, Syst. 4, Curae post. (1827) 143; Ecklon in S. Afr. Quart. Journ. 1, (1830) 359; R. Knuth in Engl. Pflanzenreich, Dioscoreaceae (1924) 321, excluding the reference to the plant in Natal; Fourcade in Mem. 20 Bot. Surv. S. Afr. (1941) 86. *Dioscorea sp.* Drège, Zwei pflanzengeogr. Dokumente (1843) 60, 135. *Tamus elephantipes* L'Héritier, Sert. Angl. (1788) 29, name only; Aiton, Hort. Kew. (1789) 401; Willdenow, Sp. Pl. 4 part 2 (1805) 772; Donn, Hort. Cantab. ed. 4 (1807) 216; Ker-Gawler in Bot. Mag. (1811) pl. 1347; Aiton, Hort. Kew, ed. 2, 5 (1813) 386 and Epitome Hort. Kew. (1814) 309; Dean, Hort. Croomensis (1824) 137; Fée, Cat. pl. Strasbourg (1836) 10: Desfontaines, Cat. pl. Paris (1839) 34. *Testudinaria elephantipes* Lindley in Bot. Reg. (1825) pl. 921; Donn, Hort. Cantab. ed. 11 (1826)

378, posthumously edited by Pursh and Lindley; W. Masters, Hort. Durovern. (1831) 93, with the issue of this catalogue the imported seeds were put on sale; Salm-Dyck, Hort. Dyckensis (1834) 273; Bojer, Hort. Maurit. (1837) 352; Krauss, Beitr. Fl. Cap u. Natal-landes (1846) 163; Kunth, Enum. pl. 5 (1850) 252; Melliss, St. Helena (1875) 338; Baker in Dyer, Fl. Cap. 6 (1896) 252; Medley Wood, Handb. Fl. Natal (1907) 133; Schönland in Rec. Albany Mus. 2 (1907) 63; Medley Wood in Trans S. Afr. Phil. Soc. 18 (1908) 238; Marloth in Chun, Wissensch. Ergebn. Exped. Valdivia, 2 part 3 (1908) 253, 317; Marloth, Dict. Common names (1917) 140; Juel, Pl. Thunbergianae (1918) 86; Schönland in Mem. 1 Bot. Surv. S. Afr. (1919) 42; Bews, Fl. Natal and Zululand (1921) 67; R. A. Dyer in Mem. 17 Bot. Surv. S. Afr. (1937) 88; Sparshott in Journ. Linn. Soc. Lond. Bot. 49 (1935) 93; Hutchinson, Botanist in S. Afr. (1946) 240. *Testudinaria montana* Burchell, Travels inter. S. Afr. 2 (1824) 148; Lindley in Bot. Reg. (1825) sub. t. 921; Durand and Schinz, Consp. Fl. Afr. 5 (1893) 276 in part.

Distribution, by administrative divisions. CAPE PROVINCE (on rain from the Atlantic) Clanwilliam Division, between the town of Clanwilliam and Boschkloof between 1000 and 2000 ft., *Meyer*; Aasvogelberg on grassy slopes at 2000 ft., *Meyer*; Clanwilliam, *Marloth* 27151. (On rain from the Mozambique current) Ladismith; Oudtshoorn; Uniondale; Willowmore; Humansdorp; Uitenhage, wherein is apparently the locus classicus; Somerset East; Bedford; Cradock; Aberdeen; Graaf Reinet, where it is common in some parts between 3000 and 4000 ft.; Alexandria and Albany.

2. **D. hemicrypta** Burkill, nomen tantum in Journ. Linn. Soc. Lond. Bot. 53 (1949) 377. *Testudinaria glauca* Marloth in herb. propr. Species in D. elephantipede adhuc immersa, sed differt tubere semisepulto, lobis sepultis vix subere occlusis.

Tuber (accurate cormus) semisepultus inter saxa et in solo sterile cacuminum clivarumque in quibus crescit, parte superiori pyramidalis, armatus tegmine testudinaceo minus quam in D. elephantipede rimoso, parte inferiori lobatus nec armatus. *Caulis* ramosissimus ut in D. elephantipede. *Folia* glaberrima, glauca, longiora quam lata, usque ad 30 × 20—25 mm., apice apiculata, margine aliquomodo indurata, pleraque 5-nervia; petiolus 10 mm. longus aut brevior. *Inflorescentiae* masculinae ex axillis foliorum distantium porrectae, singulae: axis basi sterilis. *Flores masculini* in anthesi patefacti, itidem porrecti, in quaque inflorescentia nec plures quam 20, plerique binati; pedicelli angustissime alati. *Perianthii* tubus 1 mm. concavus. *Sepala* duplo longiora quam lata, 2—2.5 × 1 mm., apice exacte rotundata. *Petala* similia, minutissime breviora. *Stamina* oblique extrusa; filamenta 0.5—0.8 mm. longa;

antherae parvae, introrsae. *Racemi feminei* pauciflori: flores pedicellati, pedicellis 2—3 mm. longis. *Ovarium* ad 5 mm. longum. *Perianthii* tubus 1 mm. concavus; lobi lobis floris masculini aequilongi sed angustiores. *Stylus* extrusus, coronatus stigmatibus dispansis nec reflexis. *Capsula* et *semina*, ut videtur, eis D. elephantipedis similes.

Cape Province. Divisio Van-Rhynsdorp, in montibus Langebergen, *Marloth* ! Divisio Ladismith, prope urbem Ladismith ad 800 m. alt., *Marloth* 3990 ! Divisio Prince Albert, *Marloth* 12731 ! Divisio Oudtshoorn, in convalle Cango ad 650 m. alt., *W. Taylor* in Herb. Marloth 12738! atque apud speluncas, *Watkin* ! Vidi etiam exempla viva in vivariis, (Kew et Southampton).

I had long watched young plants of this growing without feeling sure how to separate them from *D. elephantipes* when Marloth's photograph (see fig. 4A) came into my hand. Then I saw its most significant difference. Meanwhile Miss Sparshott's manuscript had been through my hands and I had not ventured to state that a part of her material is this; but her results are not likely to be disturbed by the circumstance. One of the Oudtshoorn specimens and the Van-Rhynsdorp specimens are described as growing on shale; another of the Oudtshoorn specimens is described as growing on limestone; the Prince Albert specimen is described as growing over a quartzite rock. The plant in Marloth's garden flowered in August and September.

3. **Dioscorea sylvatica** Ecklon in S. Afr. Quart. Journ. 1 (1830) 363; Drège in Linnaea 20 (1847) 234; Medley Wood in Journ. Bot. 46 (1906) 200; Engler, Pflanzenwelt Afr. 2 (1908) 364. spelt silvatica; Marloth in Chun, Wissensch. Ergebn. Exped. Valdivia 2, part 3 (1908) 315; Eyles in Trans. R. Soc. S. Afr. 5 (1916) 330; Bews, Fl. Natal and Zululand (1921) 67; J. M. Watt & Breyer-Brandwijck, Med. and Poison. Pl. S. Afr. (1932) 30; O. West in Mem. 23 Bot. Surv. S. Afr. (1951) 130. *D. hederifolia* Griseb. in Mart. Fl. Bras. 3 part 1 (1842) 42, based on Drège 4499 b, teste Kunth, Enum. Pl. 5, 444. *D. rehmanni* Baker in Dyer, Fl. Cap. 6 (1896) 248; R. Knuth in Engl. Pflanzenreich, Dioscoreaceae (1924) 323, as rehmannii. *D. paniculata* Dümmer in Kew Bull. (1912) 195. *D. brevipes* Burtt-Davy in Kew Bull. (1924) 232; R. Knuth in op. cit. 355. *D. marlothii* R. Knuth in op. cit. 321, as a name substituted for Testudinaria multiflora Marloth. *Dioscorea sp.* 4499 Drège, Zwei pflanzengeogr. Dokumente 2 (1843) 147. *D. elephantipes* (non Lindl. sub Testudinaria) Medley Wood, Handb. Fl. Natal (1907) 133 and in Trans. S. Afr. Phil. Soc. 18 (1908) 238, by misidentification of his no. 4386; Bews, loc. cit., following Medley Wood. *D. elephantopus* (non Sprengel) R. Knuth in op. cit., by following Medley Wood. *D. montana* (non Burchell sub Testudinaria) Durand and Schinz, Consp. Fl. Afr. 5

(1893) 276 in part; R. Knuth in op. cit. 323. *Testudinaria sylvatica* Hort. Berol. ex Kunth, Enum. Pl. 5 (1850) 443; Baker in Dyer, Fl. Cap. 6 (1896) 253; Zahlbruckner in Ann. k. k. naturhist. Mus. 15, suppl. (1900) 28; Medley Wood, Handb. Fl. Natal (1907) 133 and in Trans. S. Afr. Phil. Soc. 18 (1908) 238; Phillips in Ann. S. Afr. Mus. 16 (1917) 291; Schönland in Mem. 1 Bot. Surv. S. Afr. (1919) 42; Bews, Fl. Natal and Zululand (1921) 67; Galpin in Mem. 12, Bot. Surv. S. Afr. (1929) 64: Markötter in Ann. Univ. Stellenbosch, 8, no. 1 (1930) 16; Phillips in Journ. R. Hort. Soc. 61 (1936) 336; *T. sylvestris* Hort. Berol. ex Kunth loc. cit. (not to be confused with D. sylvestris Vell. nor with D. sylvestris De Wild.). *T. multiflora* Marloth in Trans. R. Soc. S. Afr. 3 (1913) 127 and 4 (1915) 131.

The synonymy is swollen by giving importance to characters which do not deserve more than varietal rank.

KEY TO THE VARIETIES OF D. SYLVATICA.

Leaves firm, the basal sinus wide because the auricles project outwards.
  Lamina attaining 20 × 40 mm. (see fig. 5 D). Capsules relatively small, measuring 15 mm. along the placenta, or thereabouts *sylvatica* (type)
  Lamina large attaining 60 × 80 mm. (see fig. 5 E). Capsules relatively large, measuring up to 20 mm. along the placenta.
    Pedicels to 4 mm. long .. .. var. *paniculata*
    Pedicels about 2 mm. long and the sepals often reflexed var. *brevipes*
Leaves thinner and with a narrow sinus (see figs. 5 B and C).
  Capsules 20—25 mm. long .. .. var. *rehmanni*
  Capsules only 12—14 mm. long .. .. .. var. *multiflora*

The figures 5 A and D show the form of the lamina usual in the Cape Province and familiar to earlier botanists. Then Baker was confronted with the leaf C. and made *D. rehmanni*. Northern plants in a large measure so differ; but Baker while describing Rehmann's plant as a *Dioscorea* still retained *D. elephantipes* as a *Testudinaria*. Dümmer's description of *D. paniculata* was chiefly the result of its exuberance. Otto Kuntze had used the adjective 'paniculata' as 'var. paniculata' for the same state (Revisio Genera plantarum, 3 p. 312; 1898), the coincidence accidental. The name 'elephantipes' entered into the synonymy by misidentification of a specimen; and Burchell earlier had made the same misidentification for his 3390 gathered at Zwartwaterpoort near Riebeeck East in the Albany Division; but he did not publish his identification. The entry of the name 'montana' into the synonymy is confused. Burchell's *Testudinaria montana* was *D. elephantipes* beyond all doubt. Ecklon

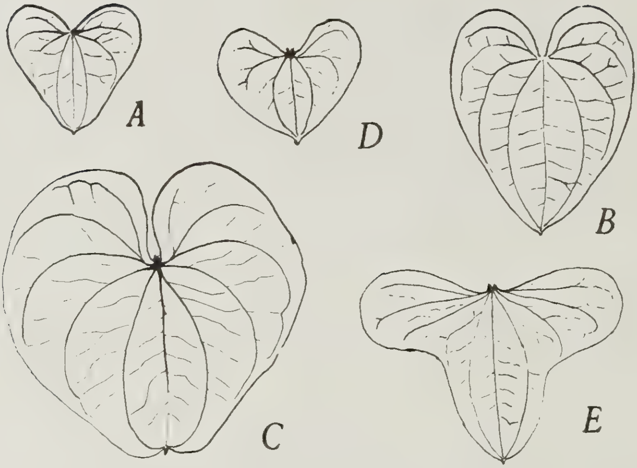

Fig. 5. The forms of leaf in *D. sylvatica*. *A*, typical of the plant in the Cape Province (from Galpin 8188, obtained in the Queenstown Division). *B*, from Marloth's *T. multiflora* obtained in the Zoutpansberg Division of the Transvaal. *C*, the largest leaf of var. *rehmanni* that has been seen (Harrismith Division, Putterill). *D*, from Burchell's no. 3390 which he thought to be *D. elephantipes*. *E*, a large leaf from var. *paniculata*, cultivated at Kew. All × ½.

and his associate Zeyher apparently put the name onto a specimen of *D. sylvatica* which reached Berlin. Dr. R. Knuth, working there, sorted out a number of specimens which presumedly matched Ecklon's and Zeyher's. I can prove from his citings that most of them are *D. sylvatica* and assume that all were. He names Sprengel as the authority, which is wrong, for Sprengel merely applied the name 'montana' to Burchell's plant. The authority for this *Dioscorea montana* is R. Knuth. Marloth's *T. multiflora* is founded on a single plant with unexpectedly small capsules and has no importance until it is shewn not to be an abnormality, but heritable.

A lotion is made from the tubers of *D. sylvatica* for outward application and assuredly saponin is the remedial substance that it contains (see Marloth, Chemistry of S. African plants and plant-products, 1913, p. 6).

Distribution by administrative divisions. Cape Province from south to north. George; Humansdorp; Knysna; Uniondale; Uitenhage whence came part of Ecklon's 892, the rest is labelled Albany; the locus classicus is therefore in one of these two divisions; Port Elizabeth, by no means rare; Adelaide; Albany, by no means rare; Somerset East; Queenstown;

Cathcart; Stutterheim; Bathurst; Elliotdale and Komgha. The varieties *paniculata* and *brevipes* occur as well as the type.

NATAL, by no means rare to the south of Durban near the coast where the sandy bush suits it, and frequent in the mountains, usually in the varieties *paniculata* and *brevipes*, rarely in the var. *rehmanni*. Umzinti; Estcourt; Utrecht; Inanda; Weenen and Vryheid; Zululand, but those who have collected it in Zululand have been careless in giving their localities.

ORANGE FREE STATE PROVINCE, in var. *brevipes* and intermediate forms towards var. *rehmanni*. Near the Natal border in the division of Harrismith.

TRANSVAAL, usually var. *brevipes* in the south and var. *rehmanni* in the north and the east. Divisions of Heidelberg; Johannesburg, Rustenburg; Waterberg; Wakkerstroom; Ermelo; Belfast; Barberton, apparently common; Pilgrimsrust; Lydenburg; Potgietersrust, whence came Leendertz's no. 1510 which Burtt-Davy took for a type of his *T. brevipes*; Pietersburg and Zoutpansberg from which came the types of *D. rehmanni* and *T. multiflora*.

SOUTHERN RHODESIA, generally var. *brevipes*. Divisions of Makoni; Bulawayo; Victoria; Mazoe; Inyanga; Umtali and Manica. The altitudes recorded are between 4300 and 5550 feet.

NORTHERN RHODESIA. Livingstone division, at Bombwe, Martin 309/32.

BASUTOLAND. Phillips in his account of the botany of the Leribe plateau names it, not as a plant proved to be there, but as a plant not unlikely to be found.